

FUJITA et al.
Serial No. 09/472,018

1. (Amended) An organic electroluminescent element comprising at least a light emitting layer containing an organic light emitting material placed between an anode and a cathode, wherein the element comprises:

(i) between the anode and the light emitting layer, at least a hole transporting layer containing a hole transporting material and an acceptor, and an electron injection restraining layer restraining the injection of electrons from the light emitting layer into the hole transporting layer, from the anode side, and/or (ii) between the light emitting layer and the cathode, at least an electron transporting layer containing an electron transporting material and a donor, and a hole injection restraining layer restraining the injection of holes from the light emitting layer into the electron transporting layer, from the cathode side; and

wherein the electron injection restraining layer and the light emitting layer are constituted by materials meeting the following formula

$$|Ea^{(A)}| \geq |Ea^{(EBL)}| \text{ and } |Ea^{(EM)}| \geq |Ea^{(EBL)}|$$

wherein $Ea^{(A)}$ represents the electron affinity of the acceptor, $Ea^{(EBL)}$ represents the electron affinity of a material of the electron injection restraining layer, and $Ea^{(EM)}$ represents the electron affinity of a material of the light emitting layer.

9 10. (Amended) An organic electroluminescent element according to claim 1 wherein the organic electroluminescent element arrangement is selected from at least one of the following:

FUTTA et al.

Serial No. 09/472,018

(1) anode/hole transporting layer/electron injection restraining layer/light emitting layer/cathode,

(2) anode/hole transporting layer/electron injection restraining layer/light emitting layer/electron transporting layer/cathode,

(3) anode/light emitting layer/hole injection restraining layer/electron transporting layer/cathode,

(4) anode/hole transporting layer/light emitting layer/hole injection restraining layer/electron transporting layer/cathode, or

(5) anode/hole transporting layer/electron injection restraining layer/light emitting layer/hole injection restraining layer/electron transporting layer/cathode.

Please add the following new claims:

12. (New) An organic electroluminescent element comprising:

a substrate supporting, proceeding from the substrate outwardly,

an anode;

a hole transporting layer;

an electron injection restraining layer;

a light emitting layer;

a hole injection restraining layer;

an electron transporting layer including an electron transporting material

and an inorganic donor; and

FUJITA et al.

Serial No. 09/472,018

a cathode;

wherein the hole injection restraining layer restrains injection of holes from the light emitting layer into the electron transporting layer.

13. (New) The element of claim 12, wherein the hole injection restraining layer comprises one of: N,N' - di(naphthylene-1-yl) - N, N' - bidiphenyl - benzidine; N, N' - bis - (3-methylphenyl)-N,N'-bis-(phenyl)-benzidine; a quinacridone base compound; a phthalocyanine base compound; polyvinyl carbazole; poly-p-phenylenevinylene; or polysilane.

14. (New) An organic electroluminescent element comprising:

a substrate supporting, proceeding from the substrate outwardly,

an anode;

a light emitting layer;

a hole injection restraining layer;

an electron transporting layer including an electron transporting material

and an inorganic donor; and

a cathode;

wherein the hole injection restraining layer restrains injection of holes from the light emitting layer into the electron transporting layer.

FUJITA et al.

Serial No. 09/472,018

15. (New) The element of claim 14, wherein the hole injection restraining layer comprises one of: N,N' - di(naphthylene-1-yl) - N, N' - bidiphenyl - benzidine; N, N' - bis - (3-methylphenyl)-N,N'-bis-(phenyl)-benzidine; a quinacridone base compound; a phthalocyanine base compound; polyvinyl carbazole; poly-p-phenylenevinylene; or polysilane.

16. (New) The element of claim 14, further comprising a hole transporting layer between the anode and the light emitting layer.

11
17. (New) The element of claim 1, wherein the electron injection restraining layer or hole injection restraining layer comprises one of: N,N' - di(naphthylene-1-yl) - N, N' - bidiphenyl - benzidine; N, N' - bis - (3-methylphenyl)-N,N'-bis-(phenyl)-benzidine; a quinacridone base compound; a phthalocyanine base compound; polyvinyl carbazole; poly-p-phenylenevinylene; and polysilane.

12
18. (New) An organic electroluminescent element comprising at least a light emitting layer containing an organic light emitting material placed between an anode and a cathode, wherein the element comprises:

(i) between the anode and the light emitting layer, at least a hole transporting layer containing a hole transporting material and an acceptor, and an electron injection restraining layer restraining the injection of electrons from the light emitting layer into the hole transporting layer, from the anode side, and/or (ii) between the light emitting

FUJITA et al.
Serial No. 09/472,018

layer and the cathode, at least an electron transporting layer containing an electron transporting material and a donor, and a hole injection restraining layer restraining the injection of holes from the light emitting layer into the electron transporting layer, from the cathode side;

wherein the electron injection restraining layer and the light emitting layer are constituted by materials meeting the following formula

$$|Ea^{(A)}| \geq |Ea^{(EBL)}| \text{ and } |Ea^{(EM)}| \geq |Ea^{(EBL)}|$$

wherein $Ea^{(A)}$ represents the electron affinity of the acceptor, $Ea^{(EBL)}$ represents the electron affinity of a material of the electron injection restraining layer, and $Ea^{(EM)}$ represents the electron affinity of a material of the light emitting layer; and

wherein the hole injection restraining layer and the light emitting layer comprise materials meeting the following formula:

$$|Ip^{(D)}| \leq |Ip^{(HBL)}| \text{ and } |Ip^{(EM)}| \leq |Ip^{(HBL)}|$$

where $Ip^{(D)}$ represents the ionization potential of a donor, $Ip^{(HBL)}$ represents the ionization potential of a material of the hole injection restraining layer, and $Ip^{(EM)}$ represents the ionization potential of a material of the light emitting layer.

13
19. (New) An organic electroluminescent element comprising at least a light emitting layer containing an organic light emitting material placed between an anode and a cathode, wherein the element comprises:

(i) between the anode and the light emitting layer, at least a hole transporting layer containing a hole transporting material and an acceptor, and an electron injection

FUJITA et al.

Serial No. 09/472,018

restraining layer restraining the injection of electrons from the light emitting layer into the hole transporting layer, from the anode side, and/or (ii) between the light emitting layer and the cathode, at least an electron transporting layer containing an electron transporting material and a donor, and a hole injection restraining layer restraining the injection of holes from the light emitting layer into the electron transporting layer, from the cathode side;

wherein the hole injection restraining layer and the light emitting layer comprise materials meeting the following formula:

$$|I_p^{(D)}| \leq |I_p^{(HBL)}| \text{ and } |I_p^{(EM)}| \leq |I_p^{(HBL)}|$$

where $I_p^{(D)}$ represents the ionization potential of a donor, $I_p^{(HBL)}$ represents the ionization potential of a material of the hole injection restraining layer, and $I_p^{(EM)}$ represents the ionization potential of a material of the light emitting layer.

REMARKS

This is in response to the Office Action dated January 3, 2002 (one month extension request herein). Claim 2 has been canceled. New claims 12-19 have been added. Thus, claims 1 and 3-19 are now pending. Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page(s) is captioned "Version With Markings To Show Changes Made."

The specification has been amended as requested by the Examiner (see page 2 of the Office Action).